B.C. Hydro

Thorsen Creek Small hydro project Bella Coola

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THORSEN CREEK SMALL HYDRO PROJECT, BELLA COOLA

SUMMARY

The 702 kilowatt (kW) hydro project at Clayton Falls and the 3600 kW Ah-Sin-Heek diesel electric generating plant have been dependable sources of electricity for the Bella Coola area for many years, but the continuous rise in oil prices has resulted in a substantial increase in diesel generating costs.

In order to reduce dependence on the diesel plant, B. C. Hydro is proposing construction of a 2500 kW run-of-the-river small hydro plant on Thorsen Creek.

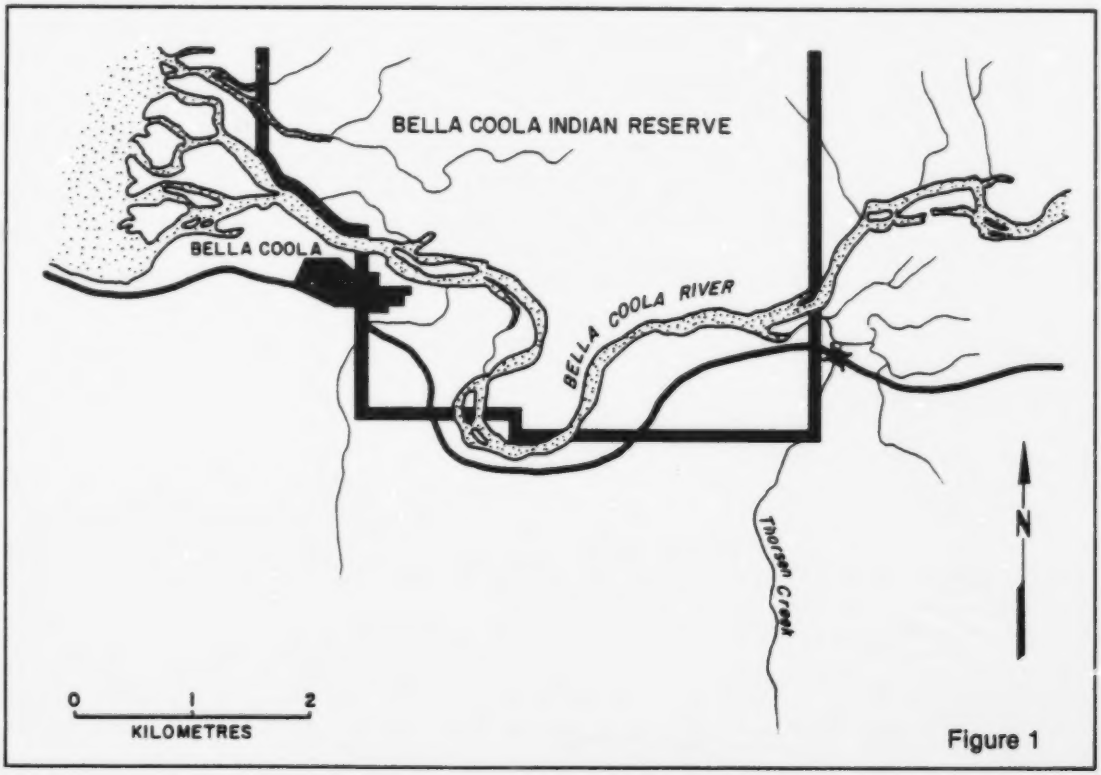

Figure 1

Location: Thorsen Creek

Size: Capacity, 2500 kW;
Average annual energy, 9 GW.h

Cost: $9.1 million(uninflated cost, excluding corporate overhead and interest during construction)

Type of plant: Run-of-the-river

Two key issues would be protection of the fisheries during the construction period and compatibility with the Bella Coola Indian Reserve's water licence application on the creek. A community consultation process will be conducted to identify any other issues of interest to local citizens.

FOR FURTHER INFORMATION ON THE PROJECT, CONTACT:

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INTRODUCTION TO BELLA COOLA

The Bella Coola valley is narrow and flat-bottomed with very steep mountains rising to 2000 metres (m) on either side. The town of Bella Coola is located 425 kilometres (km) by air northwest of Vancouver and is isolated from major highway and shipping routes. It lies about 500 km by sea from the nearest sizeable port, Prince Rupert, and 600 km from the port of Vancouver. The other main community centre is Anahim Lake which is located to the east of Bella Coola, approximately 320 km from Williams Lake.

The present population of the Bella Coola valley is more than 1700 with approximately 1000 people living in the town of Bella Coola and more than 500 people living on the Bella Coola Indian Reserve.

Figure 2

At present, the valley residents rely on two sources of electricity - the 702 kW Clayton Falls hydroelectric plant and the 3600 kW Ah-Sin-Heek diesel electric generating plant. As the Clayton Falls plant does not have a reservoir, generation is limited by the available stream flows. When the electrical demand exceeds the generating capacity of Clayton Falls, the diesel plant is used to provide the additional electricity.

WHY IS THE PROJECT NEEDED?

Because of the rising price of diesel fuel, B. C. Hydro is seeking ways in which diesel-generated electricity can be replaced or supplemented by less costly sources of energy, preferably hydroelectric. Consequently, the Thorsen Creek small hydro project is being studied as an alternative to diesel power because the cost of diesel fuel has risen to the point at which small hydro is economically feasible.

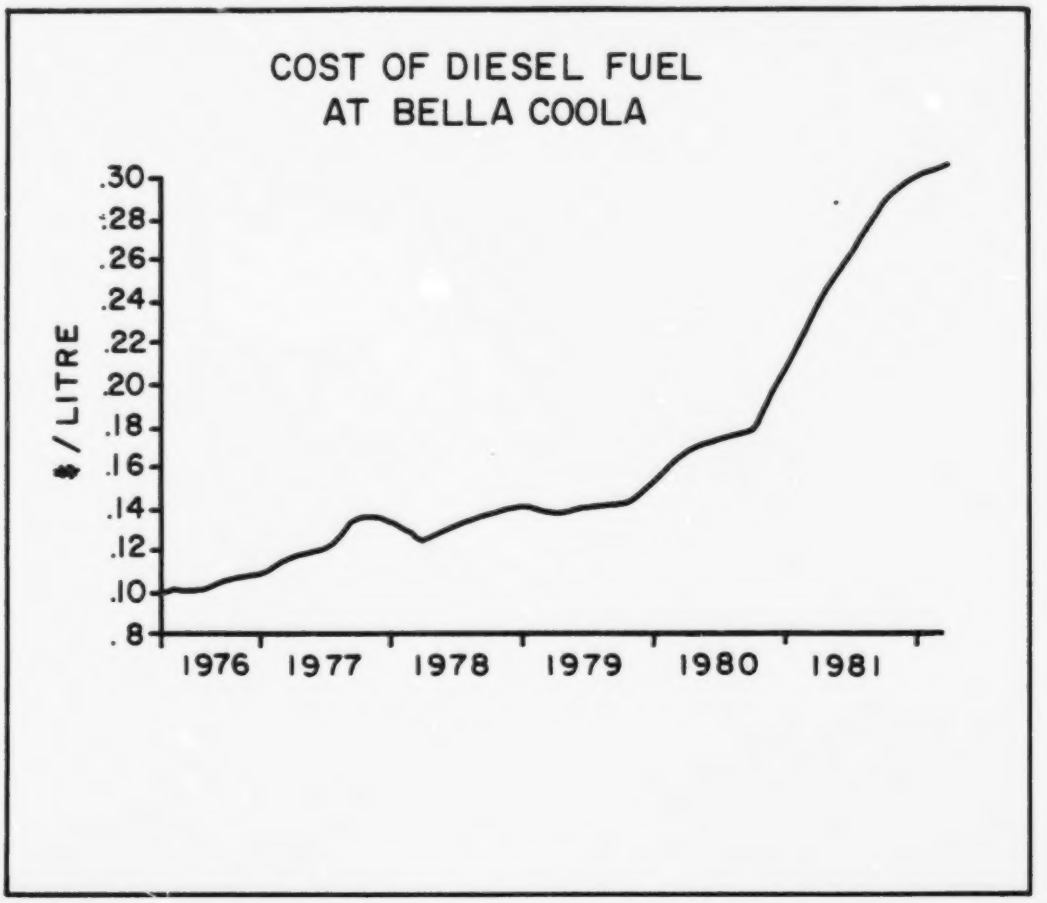

Figure 3

WHAT ARE THE ALTERNATIVES?

Eight sites in the Bella Coola valley and three sites in the Anahim Lake area were examined for accessibility, river gradient and flows, geological conditions, and distance from existing distribution lines. Cacoohtin Creek, Noomst Creek, Snootli Creek and Thorsen Creek were found to be the most promising and were selected for further study.

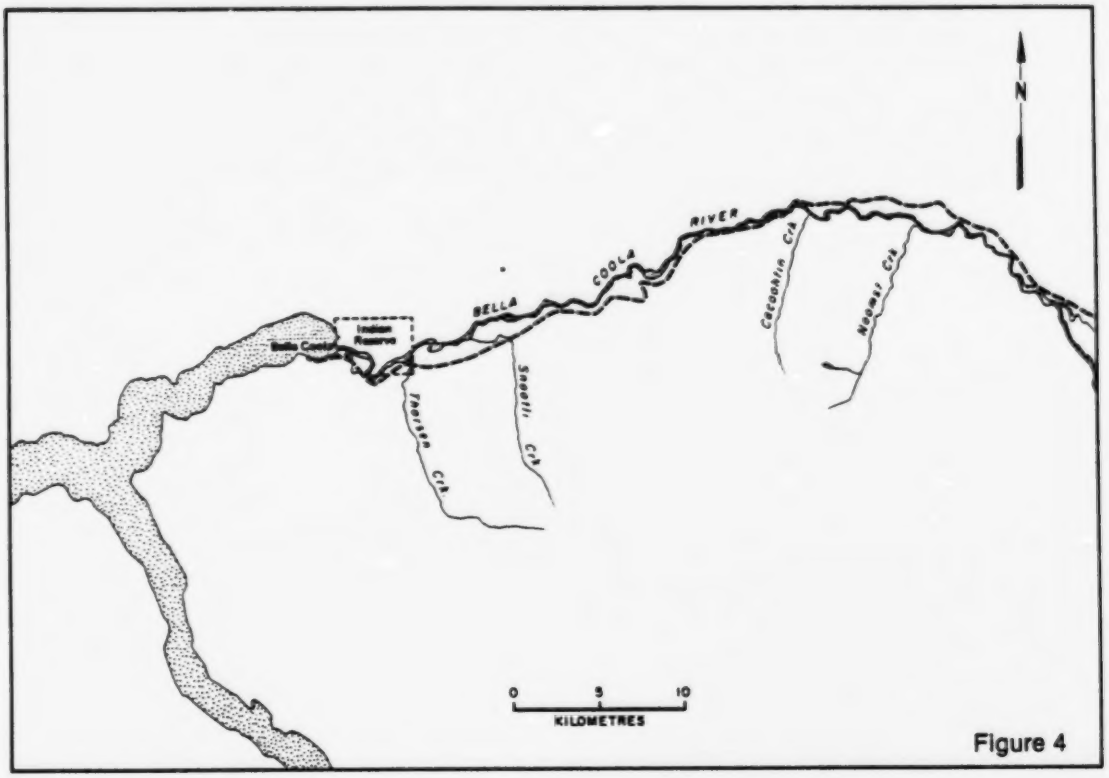

Figure 4

The site selection study showed that Thorsen Creek had the following advantages over the other potential sites:

1. proximity to the main population centre, facilitating operation and maintenance;

2. low average elevation and proximity to the sea, ensuring that winter access would not be difficult and ice problems not too severe;

3. mean annual flow and flow distribution more suitable for hydroelectric generation.

Cacoohtin Creek was also found to be an attractive site and may be considered in the future as the demand for power grows.

WHAT WOULD THE THORSEN CREEK PROJECT LOOK LIKE?

The preliminary design for the Thorsen Creek small hydro plant calls for an installed capacity of 2500 kW, with an annual generating potential of approximately 9 gigawatt-hours (GW.h). It would operate with a head of 75 m, using about 25 per cent of the total annual flow of the creek. A 1200-millimetre-diameter penstock 1350 m long would carry water down to the powerhouse.

The general features of the project include:

- a water intake;

- a settling tank downstream of the intake to allow any gravel and small stones drawn from the creek to settle out and be returned to the creek;

- a penstock laid adjacent to the access road from the powerhouse to the water intake;

- a closed surge tank to protect the penstock from waterhammer and to help regulate water flow;

- a steel-framed powerhouse with two 1250 kW turbine generator units;

- a short channel to discharge water into Thorsen Creek after it has passed through the powerhouse;

- a transformer to step up the voltage from 2400 volts (V) to 25 kilovolts (kV), and

- about 1.5 km of 25 kV transmission line leading to the existing B. C. Hydro switchyard and control centre at Ah-Sin-Heek.

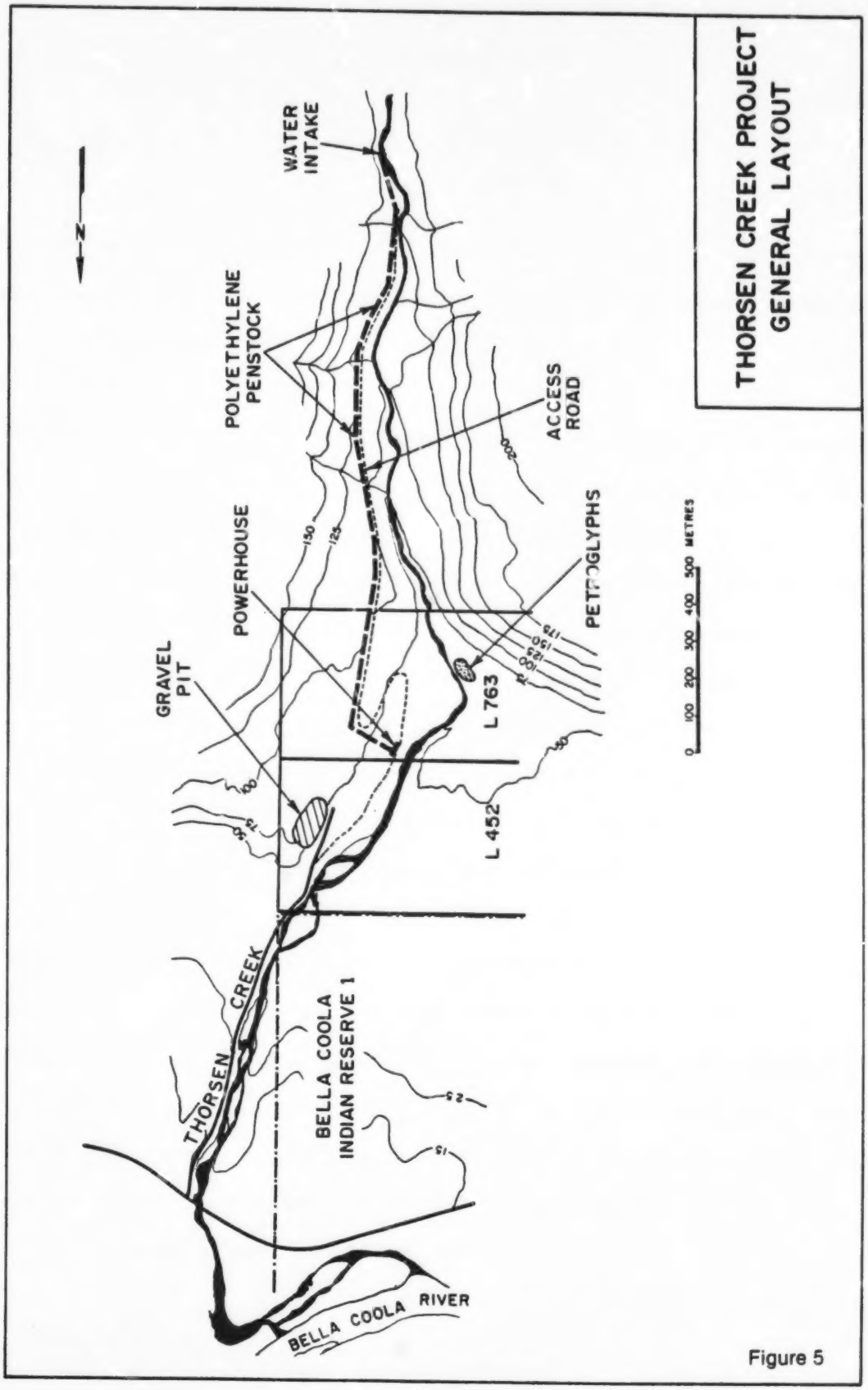
THORSEN CREEK PROJECT
GENERAL LAYOUT
WATER INTAKE
POLYETHYLENE PENSTOCK
ACCESS ROAD
POWERHOUSE
GRAVEL PIT
PETROGLYPHS
L 763
L 452
THORSEN CREEK
BELLA COOLA INDIAN RESERVE 1
BELLA COOLA RIVER
0 100 200 300 400 500 METRES

Figure 5

WHAT WOULD THE EFFECTS ON THE ENVIRONMENT BE?

Fisheries

Downstream of the proposed site of the power plant, Thorsen Creek contains various species of fish including pink, chum, coho and chinook salmon as well as steelhead trout.

The lower first kilometre of Thorsen Creek has a relatively low gradient with abundant small gravel deposits that provide important spawning and rearing habitats for the various salmon. Farther upstream the gradient increases and the creek bottom is coarser, so that spawning and rearing habitats are much less attractive. The area above the proposed powerhouse has a high gradient and is strewn with boulders leaving little spawning potential for salmon, although it probably provides a rearing habitat for Dolly Varden char and rainbow trout.

Several tributaries of Thorsen Creek also support fish. One tributary 200 m upstream of the confluence of Thorsen Creek and the Bella Coola River provides an important spawning and rearing area for coho, steelhead, cutthroat and rainbow trout. Farther upstream, Noohalk Creek supports spawning runs of chinook, coho, pink and chum salmon as well as cutthroat, rainbow and steelhead trout and possibly Dolly Varden. Another tributary, which leads from the garbage dump slough, also supports spawning runs of coho, pink and chum as well as cutthroat, steelhead and rainbow trout, and is of great importance for the rearing of fry.

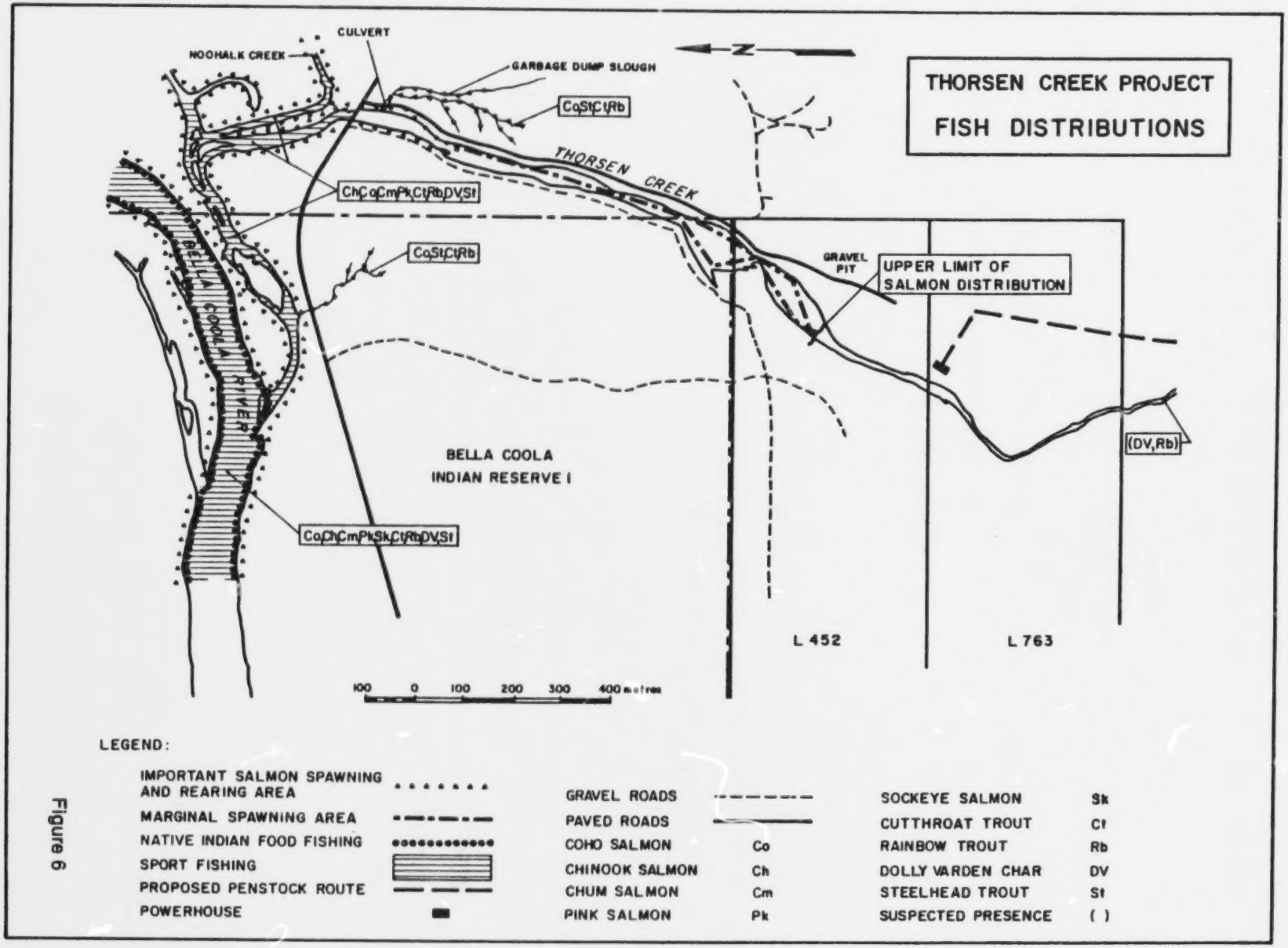
THORSEN CREEK PROJECT
FISH DISTRIBUTIONS
CULVERT
NOOHALK CREEK
GARBAGE DUMP SLOUGH
N
CoStCtRb
THORSEN CREEK
ChCoCmPkCtRbDVSt
CoStCtRb
GRAVEL PIT
UPPER LIMIT OF SALMON DISTRIBUTION
BELLA COOLA RIVER
BELLA COOLA INDIAN RESERVE I
(DV,Rb)
CoChCmPkSkCtRbDVSt
L 452
L 763
100 0 100 200 300 400 metres
LEGEND:
IMPORTANT SALMON SPAWNING AND REARING AREA
MARGINAL SPAWNING AREA
NATIVE INDIAN FOOD FISHING
SPORT FISHING
PROPOSED PENSTOCK ROUTE
POWERHOUSE
GRAVEL ROADS
PAVED ROADS
COHO SALMON Co
CHINOOK SALMON Ch
CHUM SALMON Cm
PINK SALMON Pk
SOCKEYE SALMON Sk
CUTTHROAT TROUT Ct
RAINBOW TROUT Rb
DOLLY VARDEN CHAR DV
STEELHEAD TROUT St
SUSPECTED PRESENCE ( )

Figure 6

As may be expected, it is during the spawning season that the fish are most vulnerable. As shown in Figure 7, the migration and spawning cycles vary with the different species, so it is difficult to find a period in which no spawning or rearing is occurring.

Construction activities would include the clearing of vegetation near the stream bank, construction of a weir across Thorsen Creek and installation of the water intake, penstock and powerhouse. Increased sedimentation resulting from these activities has the potential to disturb the spawning gravels and could result in a smaller production of fry and a greater egg mortality. Bank protection and channelling activities also could destroy habitats, thereby reducing the number of Dolly Varden and rainbow trout near the powerhouse and water intake sites.

Once the power plant began operating there would be little change in the water flow or habitat below the powerhouse. However, there could be times when most of the water in Thorsen Creek would be diverted through the penstock leaving only the inflow from tributary streams between the intake and powerhouse. It appears, however, that there are only a few fish in this area, so impacts should be minimal.

TIMING OF MAJOR LIFE CYCLE EVENTS FOR
FISH SPECIES PRESENT IN THORSEN CREEK INFORMATION
SUMMARIZED FROM LEANEY AND MORRIS (1981)

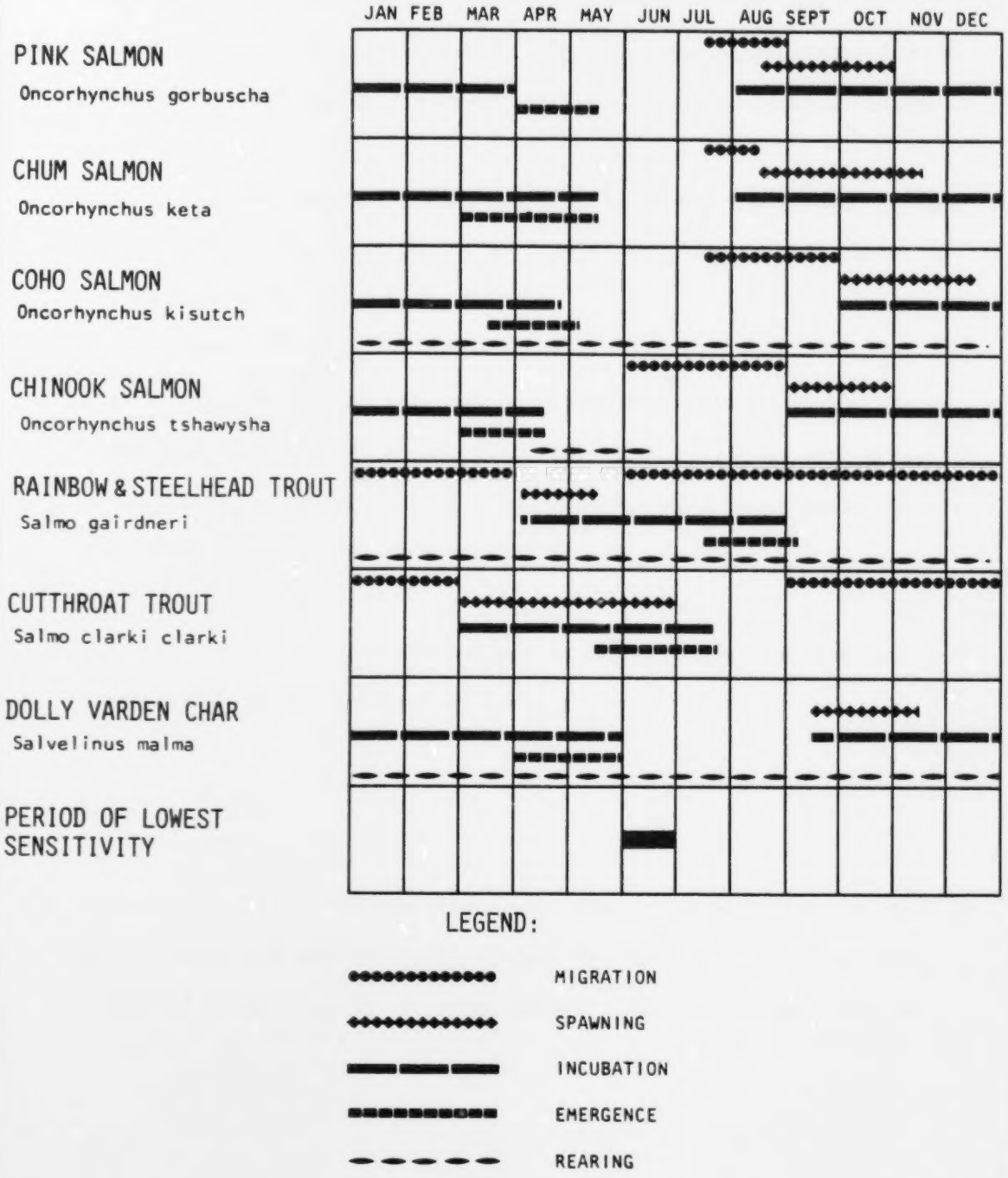

Figure 7

Forestry and Vegetation

The maximum area of forestry and vegetation that would be affected - including the intake, penstock route, powerhouse and access roads - should not exceed 10 hectares (ha). Of this area, approximately 5½ ha of marketable timber and 4½ ha of immature timber could be affected.

Access road location and design would be carefully considered. Crown Zellerbach Ltd. may wish to use or improve the road to gain access to the Thorsen Creek watershed.

Restrictions on logging and road construction practices in the Thorsen Creek watershed may be necessary in order to maintain water quality for the small hydro project, but further research must be conducted before the nature of these restrictions can be determined.

Marketable timber within the project development area would be under the jurisdiction of the Ministry of Forests.

Wildlife Impacts

Construction activities may discourage bears from using the Bella Coola garbage dump and cause them to wander into residential areas. Some method of control may be required prior to and during construction.

Some ungulates might avoid the valley during construction and use the nearby hillsides, but the animals would likely return to the valley bottom once construction ended.

Heritage Sites

The petroglyph site located on the west bank of Thorsen Creek would not be affected as the construction activity would take place on the opposite bank.

Land Status Impact

B. C. Hydro would attempt to work within established lot boundaries to reduce impacts on future development.

The Bella Coola Indian Band has applied for a domestic water licence on Thorsen Creek. Consultation with the Band and the Water Rights Branch would ensure that domestic water needs were fully met.

For further details on environmental issues, copies of the report "Thorsen Creek Project - Environmental Impact Review" (March 1982) by Sigma Resources may be reviewed at the public library in Bella Coola and at B. C. Hydro's Information Place, 970 Burrard Street, Vancouver.

PROJECT CONSTRUCTION

Final design and construction of the Thorsen Creek project would take approximately two years. The proposed construction schedule is shown on Figure 8. This schedule may be altered through budget restraints, delays in delivery of turbines and generators or in obtaining necessary approvals.

Hydro intends to use local labour and equipment wherever possible. If the contract for clearing and construction of the access road were awarded to a local contractor, a construction camp probably would not be required. However, for the main contract, where specialized skills would be required, some construction personnel would have to be imported. If there were no accommodation available in the valley for these workers, a construction camp could be provided for approximately 50 men and women for about six months.

Consultation, Review and Approvals

B. C. Hydro has discussed the proposed project with interested persons in the Bella Coola valley and will continue to do so as planning for the project develops. Among the groups that will be consulted or otherwise involved with the project before any licence or approval is sought will be residents and local government bodies, provincial ministries and agencies, and certain federal ministries.

THORSEN CREEK PROJECT
CONSTRUCTION SCHEDULE

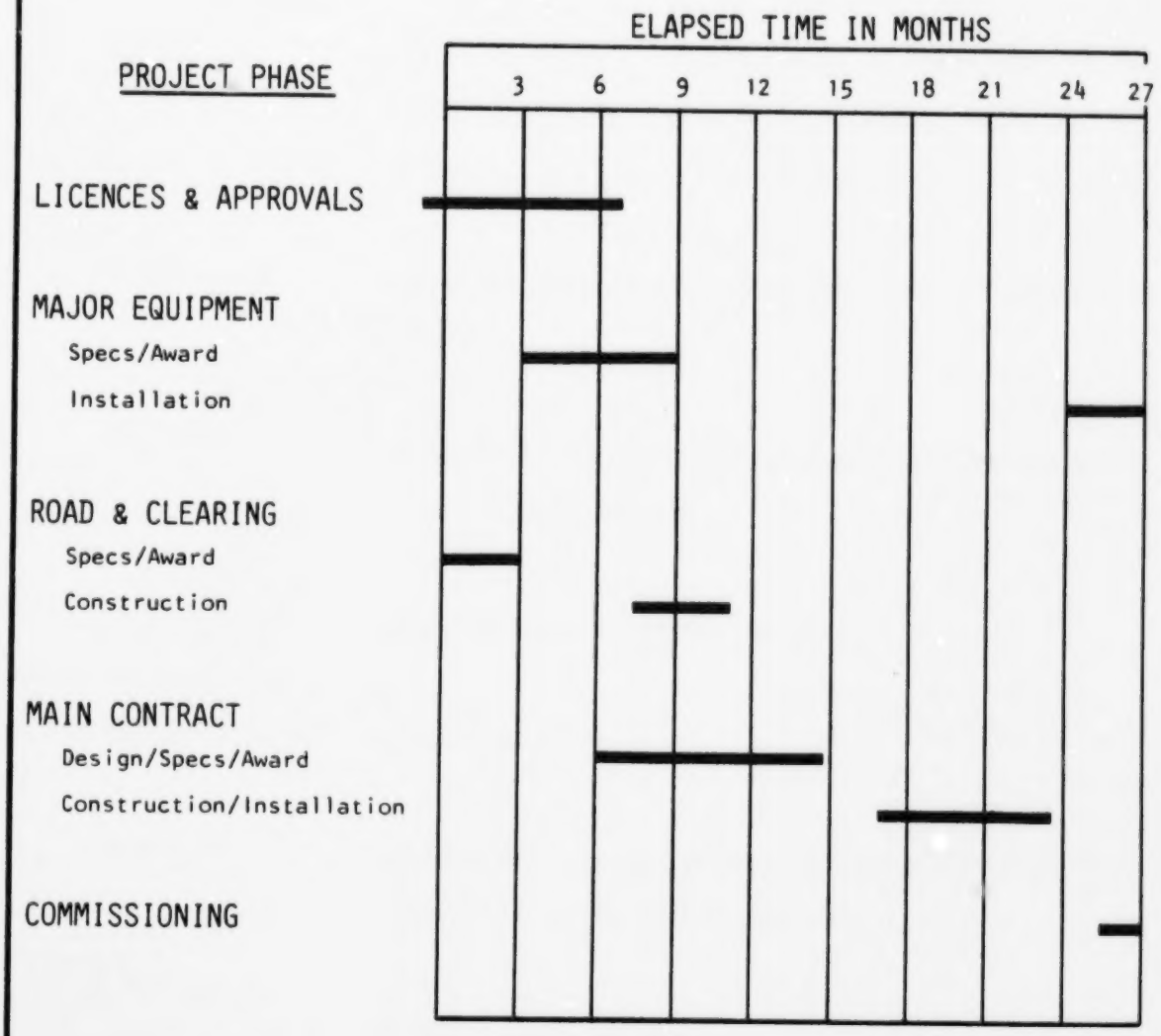

Figure 8

GLOSSARY

Capacity:	rated output power of a machine, apparatus or station, measured in watts, kilowatts, horsepower, etc.
Energy:	the doing of work, or the result of power applied for a period of time, measured in kilowatt-hours, joules, etc.
Generator:	a machine that converts mechanical power into electric power.
Gradient:	amount of slope or change of elevation from one point on a stream to another.
GW.h:	gigawatt-hour (1 000 000 kW.h)
ha:	hectare (2.47 acres)
Head:	difference in height between the water level in the reservoir and the turbine outlet.
kV:	kilovolt (1000 volts)
kW.h:	kilowatt-hour, a unit of energy equal to that expended at the rate of one kilowatt for one hour.

Penstock: tube through which water flows from a reservoir to turbines.

Petroglyph: a rock carving, usually prehistoric.

Run-of-the-river Plant: a hydroelectric generating plant operated with the unmodified flow of a river (sometimes regulated by upstream developments) rather than from a storage reservoir of its own.

Turbine: a rotary device spun by water, steam or combustion gases which drives an electric generator.

Ungulate: a mammal with hoofs, e.g. a moose.

V: volt, the basic unit of electric force or pressure.

Waterhammer: the pressure rise in a pipeline caused by a sudden decrease in the rate of flow or stoppage of flow in the pipe.

Weir: a low dam-like structure used to raise the water level of a river or stream or to divert its flow.